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EXECUTIVE SUMMARY

On July 14, 1991, a major pesticide spill occurred in a remote area of Northern California near the town of Dunsmuir. Due to a train derailment, 19,000 gallons of the herbicide metam sodium were released into the Sacramento River. Nearly all aquatic life in a 45-mile segment of the river from the spill site to Lake Shasta was killed as the chemical flowed downstream. Individuals near the river reported a variety of symptom from exposure to vapors released by the composing chemical. This report, prepared by the California Department of Health Services (DHS) Environmental Epidemiology and Toxicology Program (EETP), examines health effects of the spill reported to the local medical community from July 14 to August 16, 1991.

Findings

Sources of information for this investigation included area hospital records, pesticide illness reports filed by private physicians, and questionnaires completed by individuals using the temporary evacuation and triage center in Dunsmuir. Cases were defined as anyone who sought evaluation at one of these three sources of information for symptoms they felt were spill-related.

During the one-month period of study, 705 cases were identified. These individuals accounted for a total of 848 medical visits. The number of medical evaluations was approximately equally distributed between the hospital emergency rooms, private physicians, and triage center. Most of the cases were from Dunsmuir (70.6%), Mt. Shasta (7.2%) and Castella (6.4%) which were the three communities closest to the spill site. By age distribution, the largest number of cases were in the 30-39 age group. Relatively few cases were recorded for ages 50 and over. For each age group, more females than males reported symptoms.

A wide range of symptoms were recorded. Overall, the most common symptoms were headache (63.8%), eye irritations (48.5%), nausea (46.2%), throat irritations (42.0%), dizziness (29.6%), shortness of breath (27.1%, diarrhea (25.3%)), nasal irritation (23.1%), and chest tightness (22.4%). The types of symptoms reported varied little by gender and age. However, there were significantly fewer symptoms per person on average for those less than 20 and those greater then 69 years of age. Odors were reported by 35% of the cases. The most common odor reported was a sulfur/rotten egg smell. Symptoms did not differ significantly between those reporting an odor and those who reported no odor. Smokers appeared to have more symptoms and higher frequency for nearly all symptoms than those identified as non-smokers. However, data on odor detection and smoking history was missing for a large number of cases.

May people reported symptoms more than one week after the spill. The types of symptoms reported were similar although a significantly higher percentage of weakness, diarrhea, cough, and rash were recorded among those reporting symptoms a week or more later. Most exposure and symptom onsets appeared to occur within the first two days after the spill. However, nearly one-quarter of the cases in which initial exposure and symptom onset dates were known

appeared to delay evaluation for seven or more days after symptom onset.

Seven hospitalizations were recorded. There were four respiratory-related admissions, two cases of possible syncope (fainting), and one case of a cardiac arrhythmia in a person involved in initial clean-up activities. All were discharged by July 28. There were no fatalities.

Eight women who were pregnant at the time of the spill were identified through the investigation. No adverse pregnancy outcomes were identified although two women did obtain therapeutic abortions in part because of concerns over exposure effects.

An analysis of Dunsmuir cases suggested that nearly 14% of the population within the city limits sought medical evaluation. Within the Dunsmuir area, it appeared that exposure occurred on both sides of the river at distances of up to 1500 feet away from the river. IN an analysis using serial 300 foot zones away from each side of the river, symptom rates appeared highest among the population who lived within 300 feet of the river (21.2%), decreased and remained relatively constant at 12-15% for the population living within 301-600, 601-900, 901-1200 feet from the river, and increased to 19.8% for those living between 1201-1500 feet from the river.

Conclusions

The Cantara incident had an undeniably devastating environmental impact on the effected portion of the Sacramento River. The full extent of health effects has not been determined. The data in this report was observational, and subject to many types of bias. It can not support absolute cause and effect relationships. However, several important points can be made.

Approximately 700 individuals sought medical attention for symptoms they believed were related to the spill - a highly significant finding given the sparse population of the area. The finding that 14% of Dunsmuir city residents sought medical care is quite striking. However, the study did not include those who did not seek care. It is likely the number of cases included in this investigation is an underestimate of the true number of people affected. Symptoms were consistent with exposure to irritant gases. Irritation of the eyes, gastrointestinal tract, respiratory tract and skin occurred. Non-specific neurologic complaints also were common. Gender, age, and smoking status were factors which appeared to affect symptom reporting.

Exposure assessment is limited by a lack of environmental data for the first two days after the spill. Th exact types and concentrations of substances which were present is not know. Because metam sodium decomposes rapidly upon dilution in water, exposure-related symptoms are believed to be secondary to its volatile breakdown products of which the most likely is methyl isothiocyanate (MITC). Some symptoms probably occurred at chemical concentrations below odor threshold which is consistent with MITC toxicology. Based on odor report, exposure to hydrogen sulfide also occurred although its significance in producing symptoms is unknown. Because there were no fatalities and few hospitalizations, it is unlikely that prolonged, high-level exposures occurred.

Although most exposure and symptom onsets appeared to occur within the first two days after the spill, symptoms unexpectedly were being reported many days after the spill, symptoms

unexpectedly were being reported many days after the spill. Later symptom reports may be due to: delays in seeking medical evaluation; attributing non-spill-related symptoms to the incident; psychologically mediated symptoms similar to that seen with post-traumatic stress disorder; slowly resolving or chronic health problems related to exposure; or unrecognized or underestimated toxicologic properties of the spilled chemical such as persistence in the environment and sensitization of certain individuals to the chemicals. The long-term health effects of exposure, including effects on the reproductive system remain to be determined.

Recommendations

The incident has raised questions regarding the lack of a hazardous material classification for transportation of metam sodium, the overall safety and toxicology of metam sodium, the effectiveness and efficiency of the emergency response of public health agencies, and health care access in a crisis situation. Specific DHS follow-up activities which are currently in progress to address these concerns include:

Follow-Up Investigation of the Affected Population: DHS-EETP recently conducted a door-to-door survey in the city of Dunsmuir to determine the extent of symptoms experienced and further define exposure effects. The investigation includes individuals not seen by health care providers and will also address health care access in the area. Results will be released at a later date.

Birth Defects Monitoring: DHS is monitoring pregnancy and birth outcomes in the affected area through the DHS Genetic Disease Branch and its Birth defects Monitoring Program. An interim report is expected by Fall, 1992.

Characterization of Metam Sodium: Staff from DHS laboratories are characterizing metam sodium and its breakdown products more precisely in order to improve exposure modeling. Improved methods of measuring metam sodium and other environmental contaminants are being investigated (metam sodium toxicology has been extensively reviewed and will be discussed in an upcoming document produced by Ca-EPA).

Emergency Response Capability Improvement: DHS has collaborated with other agencies to improve the emergency response for railroad chemical spills. Staff currently participate on the Railroad Accident Prevention and Immediate Deployment Force (RAPID) which recently was established through State Senate Bill 48. DHS also is evaluating its internal emergency response procedures and methods of improvements. Field communications equipment is being upgraded. Simulated mock emergencies similar to the Cantara incident are planned periodically as a training tool for DHS staff.

Communication of Risks and Results: DHS will maintain a strong presence in Dunsmuir for the next several months to communicate with community members and physicians about health concerns.

Collaboration with Other State and Federal Agencies: DHS will continue to work with other public health agencies to support tighter regulations which protect public health in the areas of chemical classification, transportation, and marketing.